

THURSDAY, JUNE 28, 1883

THE LINKS OF THE ANIMAL
WORLD

Les Enchaînements du Monde Animal dans les Temps Géologiques. Fossiles Primaires. Par Albert Gaudry, Professeur de Paléontologie au Muséum d'Histoire Naturelle. (Paris: F. Savy, 1883.)

M. GAUDRY, a distinguished palæontologist, contributed five years ago a very interesting volume on the important and much debated question of the mammalia of the Tertiary epoch (see NATURE, vol. xviii. p. 537). The volume which he now publishes relates to the same *quæstio vexata*, but takes into consideration only the fossils that are to be found in primary strata. The author's proposed task is the same in both cases; he undertakes to find the links and connections that may exist between the animals which have successively or simultaneously inhabited the lands and seas of past epochs.

A great deal has been written on the transformism-theory of Lamarck and Darwin, and it must be expected that much more will be written. One of the principal objections made to it is that if man is really the descendant of the ape, and the ape that of other mammalia, if, generally, there exist links between all animals, living and extinct, so that all animals trace their origin to a common ancestor, how is it that no link really exists between man and ape, or between fish and frog, or between vertebrate and invertebrate? Embryological considerations, it is said, show a real connection between very different animals: a frog for instance is a fish for some time during its youth, and amphioxus looks very much like an ascidian.

But, notwithstanding numerous arguments to support Lamarck's theory, no transformist can show any species gradually losing its peculiar characters to acquire new ones belonging to another species, and thus transforming itself. However similar the dog may be to the wolf, no one has found any dead nor living animal or skeleton which might as well be ascribed to wolf as to dog, and therefore be considered as being the link between the two. One may say exactly as much concerning the extinct species; there is no gradual and imperceptible passage from one to another. Moreover, the first animals that lived on this earth are not, by any means, those that one may consider as inferior and degraded.

M. Gaudry in the first pages of his work states very clearly that he prefers the theory according to which links do exist between the extinct animals of different groups, but he does not show that facts support it yet very strongly.

The opinion one may entertain as to this question being entirely dependent upon facts and the manner of understanding them, let us now turn over the leaves of M. Gaudry's book and see whether we can find in it some firm support to Lamarck's and Darwin's theories.

According to J. Barrande's numerations the number of the species contained in the Silurian strata, comprising the Cambrian, is the following:—

VOL. XXVIII.—NO. 713

	Species.
Sponges and Protozoa	153
Corals	718
Echinodermata	588
Worms	185
Trilobites	1579
Other Crustaceans	348
Bryozoans	478
Brachiopods	1567
Lamellibranchs	1086
Heteropods and Pteropods	390
Gasteropods... ..	1316
Cephalopods	1622
Fishes	40
Of uncertain relations	4

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Thus, in the first of the primary strata nearly all the invertebrates are to be found—excepting insects—and the first vertebrate animals appear.

Generally speaking, and leaving *Eozoon canadense* and *Archæospherina* out of the question, worms are the oldest fossils to be found in the Silurian strata. It is so in England (Caerfay), in Scandinavia, in France, in Bohemia (Przibram), in America (St. John). In Russia, Crustaceans (*Obolus*) are the first fossils found. It must be therefore acknowledged that life has not begun on earth with the lowest forms. M. Gaudry, it must also be said, does not believe that such has been the case. M. Gaudry's principal aim is to show that, for instance, all Polyzoa somewhat resemble each other, and that the species are so very similar that the links between them are evident; but he does not pretend to show the relations between Worms and Crustaceans for instance, and try to find links between them.

M. Gaudry shows easily enough that, according to Nicholson's, Verrill's, and Moseley's views, the arrangement and classification of Polyp corals, Zoantharia, Tubipora, Tabulata, and Rugosa is a very difficult thing inasmuch as by some points of their anatomy the species under consideration should come in one group, and by others come in another group. The same thing may be said of Echinoderms.

Between Starfishes and Crinoids there are many links; others exist between Sea-urchins and Starfish, and Holothurians. As concerns Brachiopods, M. Gaudry remarks that the oldest species of animal on earth is the *Lingula*, so abundantly found in the *Lingula* Flags of the English Silurian. It exists to this day, being the best example of "fine old age" yet recorded. Links between the various genera of Brachiopods are not yet very firmly established. Mr. Davidson is opposed to the idea, but Mr. N. Glass's (of Manchester) researches give on the contrary some support to it, by showing how much the arms of the Brachiopods vary and differ in different animals of the same species. Mr. Davidson says that it is often very difficult to ascertain exactly the species of the individuals. Though not having seen, generally speaking, a great number of individuals of the same species, I may say however that of about twenty *Atrypa reticularis* often seen and handled by myself in one of the Parisian geological collections, not two were strictly alike. I have no doubt that the same is true of all, or at least most, species.

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Of Mollusks and Crustaceans, M. Gaudry says what he has already said of Brachiopods and other animals. As Dr. Woodward remarks, although Trilobites are always easily distinguishable from other Crustaceans (extinct, of course), one wonders at the astonishing variety afforded by this group of animals.

Let us pass over the Mollusks to see what M. Gaudry says of fishes and other Vertebrates.

Fishes begin in the Upper Silurian strata; they are abundant enough in the Ludlow beds (*Pteraspis*), and in the Downton grit (bone-bed—*Pteraspis*, *Thelodus*, *Plectrodus*, and *Ctenacanthus*). The fishes of the first ages of our globe were very singular animals; for instance, *Didymaspis grindrodi* wore on the back a *scutum* very much like that of a queer little Crustacean—at present very abundant in some places around Paris—named *Apus productus*. Pterichthys wore a yet stranger *scutum* which has been ascribed to insects, to Crustaceans, and to turtles before one could understand its meaning; it was incased in a bony helmet, and its fore-fins were also incased in a similar envelope, somewhat like the limbs of a crayfish or a lobster. Those primary fishes were sometimes devoid of a vertebral column, and nothing similar to these animals can be found among the living species. It must be therefore conceded that some links are missing, or that they have not existed.

As to Reptiles, they begin after fishes, in the Carboniferous and Permian strata, at the same time that *Batrachia* appear. The first of these, *Protriton petrolei*, has been discovered by M. Gaudry in the Permian strata of Autun, in France. *Pleuronoura pellatii*, *Branchiosaurus*, *Apatæon*, and many others resemble somewhat the *Protriton*, and M. Gaudry remarks that these little animals are generally abundant in the same strata where Labyrinthodonts and similar animals are to be found. It may be that some of them are young Labyrinthodonts. Among Reptilia M. Gaudry seems inclined to consider *Archegosaurus* and *Actinodon* as the primitive type. They had no real vertebral column, the brain was imperfectly developed, and the limbs were rather imperfect. It is easy to perceive, by careful study of other Reptilia, that they differ from these only very slightly in some cases.

M. Gaudry comes to the following general conclusions:—

There are certainly links between the Silurian, Devonian, Carboniferous, and Permian species, and links exist between these and the actually living species of the same groups. Primary Foraminifera, for instance, are very similar to the actual species of our seas and oceans. This is true also of Brachiopods, Polyps, Mollusks, and Trilobites, but less so of Echinodermata. Brachiopods perhaps illustrate this general theory best, since they are, of all animal groups, the only one that has lasted from the beginning of animal life (Lower Silurian) to the present day.

As d'Omalius d'Hallo says, "It is scarcely credible that the Almighty Being whom I consider as the Author of Nature has, at different times, killed all living animals, to give himself the pleasure of creating new animals, which, very similar to the preceding ones, present successive differences, and display a marked tendency to blend with the actually living forms."

HENRY DE VARIGNY

COLIN CLOUT'S CALENDAR

Colin Clout's Calendar; The Record of a Summer, April-October. By Grant Allen. (London: Chatto and Windus, 1883.)

OF all the writers in this country who seek to render the facts and the theories of modern science attractive to the general public, Mr. Grant Allen is in our opinion among the most successful. We know that he does not profess to be in any serious manner an original investigator of these facts, and we are far from being always ready to accept his theories; but in most of his writings we meet with a characteristic ingenuity of thought, and perhaps a still more characteristic grace of style, which together render his essays the most entertaining in the kind of literature to which they belong.

It has recently been said in these columns, with express reference to Mr. Allen, that this kind of literature does more harm than good to the cause of science and to the advancement of the theory of evolution. But here, we think, the most that can be fairly said is that his zeal may sometimes be in danger of outrunning his discretion, so inducing him to trespass upon the domain of scientific questions which a more technical biologist would feel to be precarious ground. We should remember, however, that the function of a popular writer is to make his material attractive to the general reader, and if he succeeds in doing this for science, we think that he deserves to be encouraged by scientific men, even if they find that in running somewhat too fast over the grounds of theory he occasionally trips over matters of fact. Now, as we have said, Mr. Allen, considered as a literary man, is certainly a man of unusual ability, and he devotes his ability to diffusing an interest in biology among readers of periodical literature, who certainly could not be reached by any less attractive means. Moreover, he is a man of originality, both as regards thinking and observing, and if he were to devote less time to spreading out the sweets of science for popular consumption, there can be little doubt that he might do good work in collecting them.

But, be this as it may, we think that there should be no difference of opinion touching the service which Mr. Allen has rendered in his own province, even if we do not all go so far as to say with Mr. Wallace that he "certainly stands at the head of living writers as a popular exponent of the evolution theory." The book which we have now to notice is restricted to this province, and in its main features resembles those previous volumes which from time to time have been favourably reviewed in these pages. It consists of thirty-nine short papers republished from the *St. James's Gazette*, the greater number of which are devoted to botanical subjects. As the title of the collection suggests, these papers embody a number of observations and reflections on the natural history of plants and animals commonly met with in English country life; and as the essays are written in the least technical and most graphic language, they might be read with profit by all who take any intelligent interest in these things.

We may now give a few quotations, which will serve to show the general nature of the book:—

"But what is most interesting of all about the butterfly is the fact that it is peculiarly adapted for attracting